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Safety and outcome of medical thoracoscopy as diagnostic tool for pleural and pulmonary diseases

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KEYWORDS

Medical thoracoscopy;
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Abstract *Background:* The accurate diagnosis of pleural effusion is challenging because even after thoracocentesis and/or closed pleural biopsy, 25–40% of pleural effusion remains undiagnosed. Thoracoscopy is now considered the approach of choice for diagnosis of certain kinds of pleural diseases such as pleural mass, malignant pleural effusion with negative pleural fluid cytology, and in the diagnosis of pleural tuberculosis.

Aim of study: To evaluate the diagnostic utility and safety of medical thoracoscopy in patients with undiagnosed exudative pleural effusion and pulmonary parenchyma lesions.

Methods: This study was conducted on 44 patients, 21 males and 23 females with age ranging between 32 and 74 years (mean age 57.59 ± 7.1 years). There were 38 patients with undiagnosed exudative pleural effusion, 3 patients with multiloculated pleural effusion, 1 patient with undiagnosed pulmonary nodules and 2 patients with undiagnosed pulmonary parenchyma ground glass appearance and reticulation. There were 21 patients with co morbidities and 23 patients without co morbidities.

Results: Forty four patients with undiagnosed pleural and pulmonary lesions underwent medical thoracoscopy, multiple pleural nodules were found in 24 out of 44 patients (54.54%). Pleural mass was found in 6 patients (13.63%) and pleural thickness was found in 8 patients (18.2%). Pleura loculation and adhesion was found in 3 patients (6.8%). Pulmonary nodules were found in 1 patient (2.3%). Normal thoracoscopy was found in 2 patients (4.54%) and lung biopsy was taken. As regards histopathology there were 16 patients (36.36%) diagnosed as epithelial mesothelioma, 3 patients (6.81%) diagnosed as metastatic squamous cell carcinoma, 1 patient (2.27%) diagnosed as non Hodgkin lymphoma, and 4 patients diagnosed as tuberculosis. In patients with pleural mass 3 patients (6.81%) diagnosed as sarcomatous mesothelioma and 3 patients (6.81%) diagnosed as non Hodgkin lymphoma. In 8 patients with pleural thickness, 6 patients (13.63%) diagnosed as non specific pleurisy and 2 patients (4.54%) diagnosed as tuberculosis. In 3 patients with pleural loculation they diagnosed as pleural fibrosis. One patient with pulmonary nodules (2.27%) diagnosed as small cell carcinoma. In 2 patients with normal thoracoscopy lung biopsy showed desquamative interstitial pneumonia in 1 patient (2.27%) and usual interstitial pneumonia in 1 patient (2.27%). The diagnostic yield of medical thoracoscopy was 86.4% (38 patients with definite histopathological diagnosis and 6 patients 13.6% diagnosed as non specific pleurisy). As regards thoracoscopic complications bleeding needed blood transfusion occurred in 1 patient (2.27%) with

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malignant mesothelioma, surgical emphysema occurred in 3 patients (1 with metastatic squamous cell carcinoma, 1 with tuberculous pleural effusion and 1 with loculated empyema), hypotension occurred in 1 patient underwent lung biopsy (desquamative interstitial pneumonia), the total thoracoscopic complications were 11.36% which was mild and statistically non significant.

Conclusion: Medical thoracoscopy is safe and effective for the diagnosis of benign and malignant pleural disease and pulmonary nodules.

Introduction

The accurate diagnosis of pleural effusion is challenging because even after thoracocentesis and/or closed pleural biopsy, 25–40% of pleural effusion remains undiagnosed [1,2]. The most common causes of undiagnosed exudative pleural effusion are tuberculosis and malignancy. To find out the cause of pleural effusion, biochemical, cytological and microbiological analysis of pleural fluid is a common practice. It may provide good diagnostic evidence for para-pneumonic effusion, however this initial analysis cannot detect many cases of tuberculosis and malignancy. Pleural biopsy provides diagnostic evidence for both tuberculosis and malignancy [3]. Thoracoscopy is now considered the approach of choice for diagnosis of certain kinds of pleural diseases such as pleural mass, malignant pleural effusion with negative pleural fluid cytology, and in the diagnosis of pleural tuberculosis [4]. Thoracoscopy offers several advantages compared with thoracocentesis and closed pleural biopsy, it potentially permits access to entire pleural cavity including both the parietal and visceral pleura, allows for directly visualized biopsies and affords control of bleeding [5]. The diagnostic yield of thoracoscopy in malignant and TB pleural effusion ranges from 91% to 94% and 93% to 100%, respectively. The traditional instrument used for thoracoscopy has been the rigid thoracoscope. Medical thoracoscopy with the rigid thoracoscope can be performed under conscious sedation without the need for mechanical ventilation [6]. Medical thoracoscopy can be used for therapeutic procedures, such as adhesiolysis and evacuation of pleural fluid in patients with empyema, pleurodesis in patients with malignant pleural effusion and spontaneous pneumothorax [7].

Patients and methods

This study was conducted in the Department of Pulmonary Medicine at the Al-Hussien University Hospital, Al-Azhar University, from June 2015 to May 2016. The study was approved by the local institute ethics committee. All patients underwent.

1. Detailed clinical evaluation with full history including age, sex, smoking and asbestos exposure. History of systemic hypertension, diabetes mellitus, cardiac disease, bleeding disorders, previous anesthetic complications and any medication history including anti-platelet/anticoagulant therapy were obtained.
2. Symptomatic variable as dyspnea, chest pain, toxic syndrome that is defined as presence of anorexia, weakness and weight loss.
3. General and local examination.
4. Sputum smears examinations for the presence of Acid-Fast Bacilli (AFB) on three successive days.
5. Chest X-ray and computed tomography (CT).
6. Pleural fluid aspiration and examination, for determination of glucose, protein, lactate dehydrogenase, adenosine deaminase (ADA), culture and sensitivity for bacteria, fungi, ziehl–Neelsen (Z–N) staining and cytological examination.
7. Closed pleural biopsy using Abram's needle and histopathological examination.
8. Bronchoscopy if there is any lung parenchyma lesion in CT chest.
9. Complete blood count including prothrombin time (PT), activated partial thromboplastin time (a PTT) and platelet count to rule out bleeding diathesis.

Indication of medical thoracoscopy

1. Undiagnosed pleural effusion: was defined as failure to achieve a diagnosis by initial pleural fluid analysis including pleural fluid adenosine deaminase (ADA) levels, and pleural fluid cytology and closed pleural biopsy negative for malignant cells.
2. Loculated empyema.
3. Undiagnosed pleural or pulmonary nodules.

Exclusion criteria

1. Patients with platelet count less than 75,000/mm^3 and those with PT or a PTT prolonged by more than four seconds above control.
2. Hemodynamic instability or arrhythmias.
3. Uncorrected hypoxemia despite oxygen administration.
4. Patient who cannot withhold lateral decubitus position.
5. Intractable cough.

Thoracoscopy procedure

1. Patients were kept fasting for six hours prior to the procedure.
2. Vascular access was achieved with intravenous cannula inserted in the upper limb opposite to the side of thoracoscopy.
3. Bedside chest ultrasound for determination of accurate entry port.
4. Determination of oxygen saturation.
5. We used single port for visualizing and taking pleural biopsy.

6. Thoracoscopy was usually done under local or regional anesthesia with spontaneous breathing and mild sedation (midazolam 3–5 mg IV).
7. Patients were placed in lateral decubitus position with the involved side upward.
8. After skin sterilization, local anesthesia, blunt dissection was used to enter the pleural space between fourth and sixth intercostals space along the mid axillary line.
9. Rigid thoracoscopy (KARL STORS) was inserted and the pleural fluid was drained by suction.
10. Pleural cavity, parietal, visceral and diaphragmatic pleural were inspected. Biopsies were performed under direct visual control in all suspected areas, any bleeding was controlled with electro-coagulation. Biopsies sent for histopathological examination and immunohistochemistry when requested by pathologist.
11. In cases of loculated empyema, adhesions were gently lyses using thoracoscopy or biopsy forceps to allow visualization of pleural space and drainage of infected fluid.
12. An intercostals tube was inserted before wound closure to evacuate air and fluid. Chest radiograph was performed after thoracoscopy.

Aim of the work

The aim of this study was to evaluate the diagnostic utility and safety of medical thoracoscopy in patients with undiagnosed exudative pleural effusion and pulmonary parenchyma lesion.

Statistical analysis of data

Statistical analysis was carried out using the SPSS computer package version 17.0 (SPSS Inc., Chicago, IL, USA). The collected data were statistically managed as follows:

- For descriptive statistics: the mean ± SD were used for quantitative variables while the number and percentage were used for qualitative variables.
- For analytic statistics: chi-square test was used to assess the differences in frequency of qualitative variables, while Fischer's exact test (FET) was applied if any expected cell values in a 2′2 table was < 5.
- In order to assess the differences in means of quantitative variables between both groups, independent samples *t*-test was applied.
- The statistical methods were verified, assuming a significant level of $P < 0.05$ and a highly significant level of $P < 0.001$.

Results

This study was conducted on 44 patients, 21 males and 23 females with age ranging between 32 and 74 years (mean age 57.59 ± 7.1 years). There were 38 patients with undiagnosed exudative pleural effusion, 3 patients with loculated effusion, 1 patient with undiagnosed pulmonary nodules and 2 patients with undiagnosed pulmonary parenchyma ground glass appearance and reticulation. There were 21 patients (47.7%) with co morbidities, (7 hypertension, 8 diabetic, 3 chronic bronchitis, 2 bronchial asthma, and 1 splenectomy) and 23 patients without co morbidities (Table 1).

Table 1 Demographic data and distribution of co morbidity among the studied sample.

Parameter	Number (percentage %)
Total number	44
Mean age/years	57.59 ± 7.1
Male	21 (47.7)
Mean age/years	55.71 ± 7.3
Female	23 (52.3)
Mean age/years	59.30 ± 6.5
Co morbidities	21 (47.7%)
1-Hypertension	7 (15.9%)
2-Diabetes mellitus	8 (18.18%)
3-Chronic bronchitis	3 (6.81%)
4-Bronchial asthma	2 (4.54%)
5-Splenectomy	1 (2.27%)
No co morbidity	23 (52.3%)

Table 2 shows the relation between gender and type of lesion, malignant lesion was found in 27 out of 44 patients (61.4%), it was more in females than in males with 47.7% and 52.3% respectively and malignant lesion was more common than benign lesion with 61.4% and 38.6%, respectively, the result was statistically significant $P < 0.001$.

Table 3 shows the relation between co morbidities and type of lesion, co morbidities was common in malignant lesion 19 out of 21 patients (90.4%) than in benign lesion in 2 out of 21 patients (9.6%), the difference was statistically significant $P < 0.001$.

Table 4 shows the clinical presentation, the main clinical presentation was dyspnea in 44 patients 100%, chest pain in 19 patients 43.18%, cough in 26 patients 59.1%, expectoration in 8 patients 18.2% and fever in 7 patients 15.9%.

Table 5 shows the relation between symptoms and type of lesion, dyspnea was present in all patients with malignant and benign lesion, chest pain present mainly in patients with malignant lesion, 15 out of 44 patients (34.1%) versus 5 out of 44 (11.36%) in patients with benign lesion, the difference was statistically significant $P < 0.001$. Cough was present mainly in patients with malignant lesion 22 out of 44 patients (50%) versus 4 out of 44 (9.1%) of patients with benign lesion, the difference was statistically significant $P < 0.001$. Expectoration and fever was present only in benign lesion.

Table 6 shows the relation between sign and type of lesion, right side dullness present in 19 out of 44 patients (43.2%) with malignant lesion compared to 3 out of 44 patients (6.8%) with

Table 2 Relation between gender and type of lesion.

			Type of lesion		Total	*P* value[1]
			Malignant	Benign		
Gender	Males	No	12	9	21	**< 0.001**
		%	27.3%	20.4%	47.7%	
	Females	No	15	8	23	
		%	34.1%	18.2%	52.3%	
Total		No	27	17	44	
		%	61.4%	38.6%	100.0%	

Bold value indicate significance.
[1] Fisher Exact test.

Table 3 Relation between co morbidities and type of lesion.

Co morbidities		Type of lesion		Total	*P* value[1]
		Malignant	Benign		
No co morbidity	No	8	15	23	**< 0.001**
	%	18.2%	34.1%	52.3%	
Hypertension	No	7	0	7	
	%	15.9%	0.0%	15.9%	
DM	No	8	0	8	
	%	18.2%	0.0%	18.2%	
Chronic bronchitis	No	3	0	3	
	%	6.8%	0.0%	6.8%	
Bronchial asthma	No	1	1	2	
	%	2.3%	2.3%	4.5%	
Splenectomy	No	0	1	1	
	%	0.0%	2.3%	2.3%	
Total	No	27	17	44	
	%	61.4%	38.6%	100.0%	

Bold value indicate significance.
[1] Chi square test.

Table 4 Clinical presentation.

Parameter	No (percentage %)
Symptoms	
1-Dyspnea	44 (100%)
2-Chest pain	19 (43.18%)
3-Cough	26 (59%)
4-Expectoration	8 (18.18%)
Sign	
1-Fever	7 (15.9%)
2-Right side dullness	22 (50%)
3-Left side dullness	19 (43.18%)
4-Bilateral inspiratory crepitation	3 (6.8%)

Table 5 Relation between symptoms and type of lesion.

Clinical presentation		Type of lesion		Total	*P* value[1]
		Malignant	Benign		
Dyspnea	No	27	17	44	–
	%	61.4%	38.6%	100.0%	
Chest pain	No	15	4	19	**< 0.001**
	%	34.1%	9.1%	43.2%	
Cough	No	22	4	26	**< 0.001**
	%	50.0%	9.1%	59.1%	
Expectoration	No	0	8	8	**0.016**
	%	0.0%	18.2%	18.2%	
Fever	No	0	7	7	**0.032**
	%	0.0%	15.9%	15.9%	
Total	No	27	17	44	
	%	61.4%	38.6%	100.0%	

Bold values indicate significance.
[1] Fisher Exact test.

benign lesion, left side dullness present in 7 out of 44 patients (15.9%) with malignant lesion compared to 12 out of 44 patients (27.3%) with benign lesion, and inspiratory crepitation present in 1 out of 44 patients (2.3%) with malignant lesion compared to 2 out of 44 patients (4.5%) with benign lesion, the differences were statistically non significant $P = 0.003$.

Table 6 Relation between sign and type of lesion.

Clinical presentation		Type of lesion		Total	*P* value[1]
		Malignant	Benign		
Right side dullness (pleural effusion)	No	19	3	22	**0.003**
	%	43.2%	6.8%	50.0%	
Left side dullness (pleural effusion)	No	7	12	19	
	%	15.9%	27.3%	43.2%	
Bilateral inspiratory crepitations	No	1	2	3	
	%	2.3%	4.5%	6.8%	
Total	No	27	17	44	
	%	61.4%	38.6%	100.0%	

Bold value indicate significance.
[1] Chi square test.

Tables 7 and 8 show chest X-ray and chest computed tomography finding, right side pleural effusion present in (43.2%) of patients with malignant lesion compared to (6.8%) in patients with benign lesion, left side pleural effusion present in (27.3%) of patients with malignant lesion compared to (15.5%) in patient with benign lesion, bilateral pulmonary nodules with mediastinal and hilar lymph nodes enlargement present in 2.3% of patient with malignant lesion compared to 0.0% of patient with benign lesion and bilateral ground glass appearance present in 4.5% in patients with benign lesion compared to 0.0% in patient with malignant lesion, the differences was statistically non significant.

Table 9 shows the relation between thoracoscopic finding and type of lesion, multiple pleural nodules were found in 24 out of 44 patients (54.5%), (malignant lesion was found in 20 patients (45.5%), and benign lesion was found in 4 patients (9.5%)). Pleural mass was found in 6 patients (13.6%) and all were malignant lesions. Pleural thickness was found in 8 patients (18.2%) and all were benign lesions. Pleura loculation and adhesion were found in 3 patients (6.8%) and all were benign lesions. Pulmonary nodules were found in 1 patient (2.3%) and it was a malignant lesion. Normal thoracoscopy was found in 2 patients and lung biopsy showed benign lesions.

Table 7 Relation between chest X-ray finding and type of lesion.

Chest X-ray finding		Type of lesion		Total	*P* value[1]
		Malignant	Benign		
Right side pleural effusion	No	19	3	22	**0.002**
	%	43.2%	6.8%	50.0%	
Left side pleural effusion	No	7	12	19	
	%	15.9%	27.3%	43.2%	
Bilateral pulmonary nodules	No	1	0	1	
	%	2.3%	0.0%	2.3%	
Bilateral ground glass appearance	No	0	2	2	
	%	0.0%	4.5%	4.5%	
Total	No	27	17	44	
	%	61.4%	38.6%	100.0%	

Bold value indicate significance.
[1] Chi square test.

Table 8 Relation between chest computed tomography and type of lesion.

Chest computed tomography		Type of lesion		Total	*P* value[1]
		Malignant	Benign		
Right side pleural effusion	No	19	3	22	**0.002**
	%	43.2%	6.8%	50.0%	
Left side pleural effusion	No	7	12	19	1.000
	%	27.3%	15.9%	43.2%	
Bilateral pulmonary nodules, hilar and mediastinal LN enlargement	No	1	0	1	0.272
	%	2.3%	0.0%	2.3%	
Bilateral ground glass appearance	No	0	2	2	0.515
	%	0.0%	4.5%	4.5%	
Total	No	27	17	44	
	%	61.4%	38.6%	100.0%	

Bold value indicate significance.
[1] Fisher Exact test.

Table 9 Relation between thoracoscopic finding and type of lesion.

Thoracoscopic finding		Type of lesion		Total	*P* value[1]
		Malignant	Benign		
Multiple pleural nodules	No	20	4	24	**0.002**
	%	45.5%	9.1%	54.5%	
Pleural mass	No	6	0	6	0.067
	%	13.6%	0.0%	13.6%	
Pleural thickness	No	0	8	8	**0.016**
	%	0.0%	18.2%	18.2%	
Pleural loculation and adhesion	No	0	3	3	0.272
	%	0.0%	6.8%	6.8%	
Pulmonary nodules	No	1	0	1	0.272
	%	2.3%	0.0%	2.27%	
Normal thoracoscopy	No	0	2	2	0.272
	%	0.0%	4.54%	4.54%	
Total	No	27	17	44	
	%	61.4%	38.6%	100.0%	

Bold values indicate significance.
[1] Fisher Exact test.

Table 10 shows comparison between thoracoscopic finding and histopathological types, in 24 patients with pleural nodules, there were 16 patients (36.36%) diagnosed as epithelial mesothelioma, 3 patients (6.81%) diagnosed as metastatic squamous cell carcinoma, 1 patient (2.27%) diagnosed as non Hodgkin lymphoma, and 4 patients diagnosed as tuberculosis. In patients with pleural mass 3 patients (6.81%) diagnosed as sarcomatous mesothelioma and 3 patients (6.81%) diagnosed as non Hodgkin lymphoma. In 8 patients with pleural thickening, 6 patients (13.63%) diagnosed as non specific pleurisy and 2 patients (4.54%) diagnosed as tuberculosis. In 3 patients with pleural loculation, diagnosed as pleural fibrosis. One patient with pulmonary nodules (2.27%) diagnosed as small cell carcinoma. In 2 patients with normal thoracoscopy lung biopsy showed desquamative interstitial pneumonia in 1 patient (2.27%) and usual interstitial pneumonia in 1 patient (2.27%).

Table 11 Shows thoracoscopic complications, bleeding needed blood transfusion occurred in 1 patient (2.27%) with malignant mesothelioma, surgical emphysema occurred in 3 patients (1 with metastatic squamous cell carcinoma, 1 with tuberculous pleural effusion and 1 with loculated empyema), hypotension occurred in 1 patient underwent lung biopsy (desquamative interstitial pneumonia), the total thoracoscopic complications were 11.36% which was statistically non significant $P = 0.265$ (Figs. 1–6).

Discussion

Medical thoracoscopy is a minimally invasive procedure that allows complete visualization of the pleural space using a combination of viewing and working instruments enabling the diagnostic and the therapeutic procedures [8]. Thoracoscopy is a safe and valuable tool for diagnosis of undiagnosed pleural effusion, particularly for patients with high probability of malignancy. Overall cost effectiveness of thoracoscopy is better in view of its better yield and lesser duration of hospital stay [9].

In this study there were 38 patients with undiagnosed exudative pleural effusion, 3 patients with undiagnosed loculated pleural effusion, 1 patient with undiagnosed pulmonary nodules and 2 patients with undiagnosed pulmonary parenchyma ground glass appearance and reticulation. There were 21 patients (47.7%) with co morbidities and 23 patients (52.3%) without co morbidities. The main presenting symptoms were dyspnea 100%, cough 59% and chest pain 43.18% which were common in patients with malignant lesion, this findings in agreement with study that was done by Hatata et al., they found that the main presenting symptom was dyspnea (100% of patients), while cough, chest pain and loss of weight were observed in 60%, 20% and 26.7% of cases respectively [10].

Chest X-ray and CT chest confirmed the presence of pleural effusion in 38 patients, loculated pleural effusion in 3 patients, pulmonary nodules in 1 patient and pulmonary parenchyma ground glass appearance and reticulation in 2 patients. Before thoracoscopy portable chest ultrasound was done to localize the optimal site of entry.

In this study the thoracoscopy showed that multiple pleural nodules were found in 24 out of 44 patients (54.54%). Pleural mass was found in 6 patients (13.6%). Pleural thickness was found in 8 patients (18.2%). Pleura loculation and adhesion (empyema) was found in 3 patients (6.8%). Pulmonary nodules were found in 1 patient (2.3%). Normal thoracoscopy was found in 2 patients. In all patients multiple biopsies were taken to increase the diagnostic yield. As regard histopathological diagnosis, in 24 patients with pleural nodules, there were 16 patients (36.36%) had epithelial mesothelioma, 3 patients (6.81%) had metastatic squamous cell carcinoma, 1 patient (2.27%) had non Hodgkin lymphoma and 4 patients diagnosed as tuberculosis. In patients with pleural mass 3 patients (6.81%) diagnosed ad sarcomatous mesothelioma and 3 patients (6.81%) diagnosed as non Hodgkin lymphoma. In 8 patients with pleural thickening, 6 patients (13.63%) diagnosed as non specific pleurisy and 2 patients (4.54%) diagnosed as tuberculosis. In 3 patients with pleural loculation, diagnosed as pleural fibrosis. In 1 patient with pulmonary nodules diagnosed as small cell carcinoma, in 2 patients with nor-

Table 10 Comparison between thoracoscopic finding and histopathological types.

	Thoracoscopic finding	Histopathological result no (%)	Benign lesion no (%)	Malignant lesion no (%)	*P* value[1]
Pleural lesion	Pleural nodules 24 (54.54%)	– Epithelial mesothelioma 16 (36.36%)-	0 (0.0%)	16 (36.36%)	**< 0.001**
		– Metastatic squamous cell carcinoma 3 (6.81%)	0 (0.0%)	3 (6.81%)	
		– Tuberculosis 4 (9%)	4 (9%)	0 (0.0%)	
		– Non Hodgkin lymphoma 1 (2.27%)	0 (0.0%)	1 (2.27%)	
	Pleural mass 6 (13.6%)	– Sarcomatous mesothelioma 3 (6.81%)	0 (0.0%)	3 (6.81%)	
		– Non Hodgkin lymphoma 3 (6.81%)	0 (0.0%)	3 (6.81%)	
	Pleural thickening 8 (18.18%)	– Non specific pleurisy 6 (13.63%)	6 (13.63%)	0 (0.0%)	
		– Tuberculosis 2 (4.45%)	2 (4.54%)	0 (0.0%)	
	Pleural loculation 3 (6.81%)	– Pleural fibrosis 3 (6.81%)	3 (6.81%)	0 (0.0%)	
Pulmonary lesion	Pulmonary nodules 1 (2.27%)	Small cell carcinoma 1 (2.27%)	0 (0.0%)	1 (2.27%)	-
	Normal 2 (4.45%)	– Desquamative interstitial pneumonia 1 (2.27%)	1 (2.27%)	0 (0.0%)	
		– Usual interstitial pneumonia 1 (2.27%)	1 (2.27%)	0 (0.0%)	
Total	44	44 (100.0%)	17 (38.63%)	27 (61.36%)	

Bold value indicate significance.
[1] Chi square test.

Table 11 Thoracoscopic complications.

Parameters	No 44 (%)	Histological type	*P* value[1]
1-Bleeding need transfusion	1 (2.27%)	– Malignant mesothelioma (epithelial type)	0.265
2-Surgical emphysema	1 (2.27%)	– Metastatic squamous cell carcinoma	
	1 (2.27%)	– Tuberculosis pleural effusion	
	1 (2.27%)	– Loculated Empyema (pleural fibrosis)	
3-Hypotension	1 (2.27%)	– Lung biopsy (desquamative interstitial pneumonia	
Total	5 (11.36%)		

[1] Chi square test.

Figure 1 Chest X-ray of 34 male patient with loculated empyema.

mal thoracoscopy lung biopsy showed desquamative interstitial pneumonia in 1 patient (2.27%) and usual interstitial pneumonia in 1 patient (2.27%).

In my study all over, malignant lesion was present in 27 patients (61.4%) and benign lesion was present in 17 patients (38.6%). The study conducted by Laila et al. [9] found the thoracoscopic findings in the studied group, in which nodules were found in 28 patients (77%), 5 patients (12.5%) had sago grain nodules, 3 patients (7.5%) had adhesions, one patient had collection of pus, one patient (2.5%) had a mass, one patient (2.5%) had Violaceous lesion, and one patient (2.5%) had normal pleura, also they found that the malignancy was diagnosed in 28 patients (70%), malignant pleural mesothelioma was diagnosed in 15 patients (53.6%), while metastatic pleural malignancy found in 13 patients. Metastatic adenocarcinoma was found in 10 patients (35.6%), non-Hodgkin lymphoma was found in one patient (3.6%), mucoepidermoid carcinoma was found in one patient (3.6%), and lastly Kaposi sarcoma which was found in one patient (3.6%).

In the study which was done by Nattusamy et al. [11], out of the 36 patients who were initially suspected to have malignant pleural effusion on clinico-radiological basis, malignant pleural involvement was confirmed on histopathology in 30 patients. Non-specific pleurisy was diagnosed in five patients and normal pleura in one patient. No patients were diagnosed with tuberculosis (TB) in this group. Out of the 10 patients with clinico-radiological suspicion of TB, 2 patients had histopathologically confirmed TB and remaining 8 patients

Figure 2 Chest ultrasound of the same patient showed multiple loculated pleural effusion.

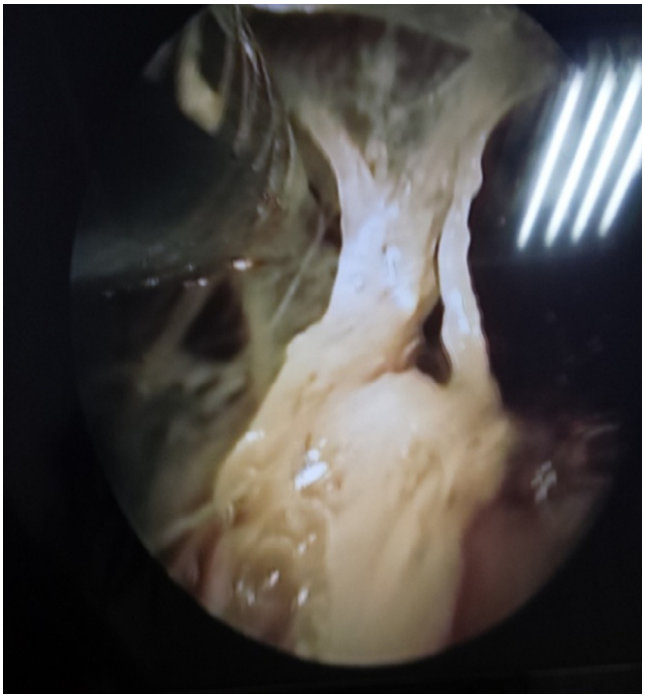

Figure 3 Thoracoscopy of the same patient showed multiple loculation with adhesion.

had non-specific pleurisy. Of the two patients with empyema who underwent semi-rigid thoracoscopy, one patient had normal pleura and the other had non-specific pleurisy on pleural biopsy. Both these patients had remarkable improvement after thoracoscopic adhesiolysis and guided chest tube drain placement. In another study by Prabhu and Narasimha [12], a total of 68 patients underwent pleuroscopy from September 2007 to August 2010. Nodules were found in 33 patients, 26 patients

Figure 4 Chest X-ray of the same patient after thoracoscopy and cutting of pleural adhesion.

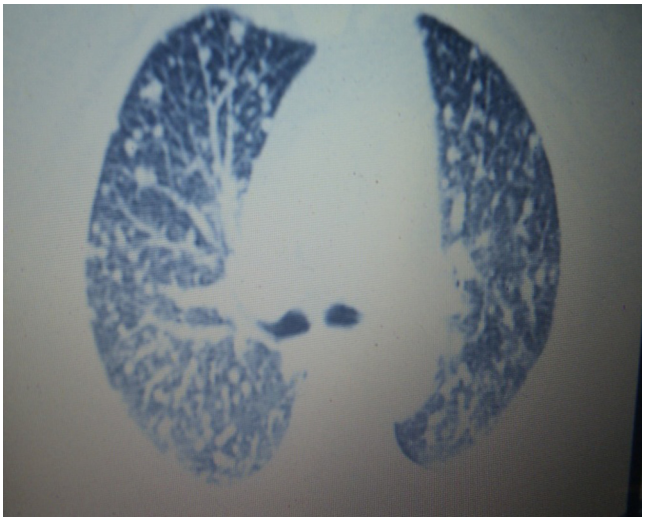

Figure 5 CT chest of 54 year old patient with bilateral pulmonary nodules.

had adhesions, 8 patients had sago grain appearance, and 1 patient had normal pleura. Out of 68 patients, 24 patients had malignancy, 16 patients had tuberculosis, 22 patients had non-specific inflammation, 2 patients had empyema, 1 patient had sarcoidosis, 1 patient had normal pleura and it was non-diagnostic in 2 patients. The diagnostic yield for a pleuroscopic pleural biopsy was 97%. In 24 patients who had malignancy, 15 patients had metastatic adenocarcinoma, three patients had mesothelioma, three patients had undifferentiated carcinoma, one patient had lymphoma, one patient had metastatic clear cell carcinoma and one patient had metastatic squamous cell carcinoma. In 22 patients who had no specific inflammation eight patients had chronic inflammation, seven patients had fibrinous exudates, four patients had subacute inflammation and three patients had lymphohistiocytic infiltrates. There were no major complications, only four

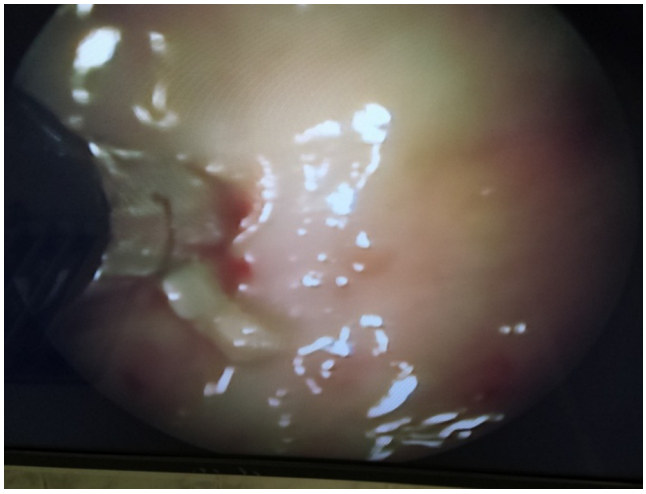

Figure 6 Multiple pleural nodules in 65 year old female patient with hemorrhagic pleural effusion.

patients had minor complications like subcutaneous emphysema (3 patients) and prolonged air leak (1 patient).

In this study there were 3 cases of multiloculated empyema with difficult drainage due to adhesions, thoracoscopy with performing mechanical adhesiolysis, cutting of septa and drainage of pleural fluid resulted in marked clinical and radiological improvement in form of lung expansion. Wakabayashi [13] described 20 patients who underwent debridement of chronic empyema by thoracoscopy through a small incision, the lungs reexpanded in 18 patients (90%). The lung failed to reexpand in two patients, both of whom had empyema for more than 4 months duration. Ridley and Braimbridge [14] reported overall complete resolution of empyema in 18 of 30 (60%) selected patients even though many were investigated at a late stage after initial treatment regimens had failed. Of the 12 patients who did not have complete resolution after thoracoscopy, the empyema resolved in eight (66%) patients after open surgical procedures. Thoracoscopic debridement may provide valuable time to improve the clinical condition of debilitated patients until they can tolerate more aggressive surgical approaches. With thoracoscopy, the loculations in the pleural space can be disrupted, the pleural space can be completely drained, and the chest tube can be optimally placed [15]. Patients with multiloculated thoracic empyema stratified by ultrasonography and treated early by medical thoracoscopy show that this approach is safe, minimally invasive, and efficient in these patients with a disease having relevant mortality [16].

In this study there were 3 patients with pulmonary parenchyma lesion, one patient with multiple pulmonary nodules and two patients with bilateral ground glass appearance, bronchoscopy and transbronchial biopsy was taken without reach histopathological diagnosis, thoracoscopic lung biopsy was done with definite histopathological diagnosis in all three cases. In the study done by Vansteenkiste et al., [17] they found that medical thoracoscopy with lung biopsy is an effective and safe procedure in the hands of well trained interventional pulmonologists.

In study done by Molin et al. [18] they found that medical thoracoscopic lung biopsy (MTLB) can be an interesting second choice for interventional pulmonologists in a variety of interstitial lung diseases (ILD) if transbronchial lung biopsy (TBB) or bronchoalveolar lavage (BAL) has failed to provide a diagnosis. The technique has some advantages over a surgical biopsy, which can be reserved as the final step in many instances. The possibility to take several biopsies from different sites under visual guidance, and the lower morbidity are the most important advantages.

In this study histopathological diagnosis was malignant in 27 out of 44 patients (61.36%) and benign in 17 out of 44 patients (38.64%). The diagnostic yield of medical thoracoscopy was 86.4% (38 patients with definite histopathological diagnosis and 6 patients (13.6%) diagnosed as non specific pleurisy. But if 6 patients diagnosed as non specific pleurisy were included the diagnosis was definite in all patients (100%) without a need for other procedures to confirm the diagnosis, so thoracoscopic forceps pleural and lung biopsy in the diagnosis of different pleural and lung lesions as well as therapeutic mechanical adhesiolysis in loculated empyema are safe and efficient. In the study done by Laila et al. [9], medical thoracoscopy gave a definitive diagnosis in 38 out of 40 patients with a diagnostic yield of 95%. In another study by Prabhu and Narasimhan [12] they found that the diagnostic yield of thoracoscopy was 97%.

In this study as regards thoracoscopic complications, one patient developed bleeding need blood transfusion (malignant mesothelioma), three patients developed surgical emphysema which may be related to size of the wound and tightness of the sutures, and one patient developed hypotension. There is no mortality and complications were statistically non significant. In comparison with other studies like in Menzies et al. [19], Francois et al. [20], Munavvar et al. [21], and Law et al. [22], overall complication rates for thoracoscopy are 1% to 5%; however, most are minor and do not prolong hospital stay. Complications include subcutaneous emphysema (0.6–5%), empyema (2–3%), bleeding (0.4–2%), and reexpansion pulmonary edema (2.2%). mortality rate of 0.8% has been published from large centers performing pleuroscopy [23]. So medical thoracoscopy is an extremely useful diagnostic modality that can often contribute crucially to accurate clinical decision-making in patients with undiagnosed pleural effusion [24,25].

Conclusion

Medical thoracoscopy is safe and effective for the diagnosis of benign and malignant pleural disease and pulmonary nodules. Medical thoracoscopy is preferable when performing adhesiolysis in cases of loculated empyema.

Conflict of interest

There are no conflict of interest.

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